GA1.13: RCED-89-135

United States General Accounting Office

GAO

Report to Congressional Requesters

22

e 1989

# STANDARDS AND TECHNOLOGY

## Impact of Fee Increases on Measurement Services

/RCED-89-135

GAO

**United States**
**General Accounting Office**
**Washington, D.C. 20548**

**Resources, Community, and**
**Economic Development Division**

B-235260

June 22, 1989

The Honorable Robert A. Roe
Chairman, Committee on Science,
Space and Technology
House of Representatives

The Honorable Robert S. Walker
Ranking Minority Member, Committee on
Science, Space and Technology
House of Representatives

On October 20, 1988, you requested that we analyze the potential impact of proposed fee increases on sales of calibration services and standard reference materials provided by the National Institute of Standards and Technology (NIST)—formerly the National Bureau of Standards—in the Department of Commerce. As agreed with your office, to assess the impact of the fee increases, we analyzed the changes in prices and corresponding changes in service levels (demand) for calibration services and standard reference materials between fiscal years 1979 and 1988. We also evaluated the justification for proposed fiscal year 1989 fee increases that NIST submitted to your Committee on September 19, 1988.

## Results in Brief

Because data were not readily available to measure the impact of various factors that affect demand, we could not determine how much impact, if any, price changes alone had on the demand for NIST calibration services and standard reference materials between fiscal years 1979 and 1988. Our analysis suggested, however, that demand was affected by factors other than price changes, such as the market conditions for NIST customers' products and services.

In justifying its proposed fiscal year 1989 fee increases, NIST did not fully explain the nature or the likely impact of the fee increases on the demand for measurement services, which we believe would have helped the Committee evaluate the appropriateness of the increases.

## Background

Calibration services and standard reference materials assist businesses and research laboratories in precisely measuring the physical and chemical properties of materials. Calibration services generally include checking, adjusting, or characterizing particular instruments, devices, or sets of standards on a one-time-per-request basis. The cost for these services

in fiscal year 1988 averaged $471 per calibration and ranged from less than $100 to calibrate a laboratory thermometer to over $50,000 for special tests of large microwave antenna systems. Standard reference materials are certified for certain chemical properties, such as the composition of steel, or physical properties, such as the thickness or weight of coatings. They can be used for calibrating an instrument, assessing a measurement method, or assigning values to materials. In fiscal year 1988 the cost for standard reference materials averaged $144 per unit and, according to a NIST official, ranged from $39 for five microcopy test charts to $3,536 for an optical microscope linewidth-measurement standard used in manufacturing integrated circuits.

## Fees for Calibration Services

NIST's customers are charged for calibration services based on the number of tests performed on an item. In December 1987 NIST increased the price of calibration services, which had been based on its technical division's costs to perform these services and an operations surcharge of about 13 percent to cover administrative office expenses, by adding a "development surcharge" to support the development of new and improved calibration services. NIST set the development surcharge at 8 percent of the technical division's costs to perform calibration services for fiscal year 1988 and plans to increase it by 8 percent each year until the surcharge is about 40 percent of the technical division's costs in fiscal year 1992.

## Fees for Standard Reference Materials

The price of a standard reference material is based on (1) the direct cost of producing and certifying it; (2) an operations surcharge to cover packaging, inventory, sales, and distribution costs; (3) fees to cover such costs as obsolescence and differences between direct production costs and fair market value; and (4) a development surcharge that was introduced in fiscal year 1983 for the development of new and improved standard reference materials. In December 1987 NIST increased the development surcharge from 15 percent to 20 percent of the direct cost of producing a standard reference material, which on average represented only about 39 percent of NIST's total price. (The surcharge was $7.80 on average for standard reference materials costing $100.) NIST plans to increase the development surcharge by 5 percent annually until it is about 40 percent of the direct production cost in fiscal year 1992.

## Requirement That NIST Justify Further Fee Increases

Section 5114 of the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418) requires that NIST justify in writing to the Senate Committee on Commerce, Science and Transportation and the House Committee on Science, Space and Technology all policy changes regarding fees for standard reference materials and calibration services, including a description of the anticipated impact of any proposed changes in demand for and revenues from these services.

## Changes in Factors Other Than Price Can Affect Demand for NIST Measurement Services

In analyzing the changes in real average prices and service levels for standard reference materials and calibration services between fiscal years 1979 and 1988, we found that factors other than price also affected the demand for these services.[1] According to NIST officials, price increases generally have affected the demand for NIST measurement services less than other factors, such as general economic conditions, market conditions for products or services that NIST's customers provide, and the availability and price of alternative services. The NIST officials noted that measurement service costs are negligible in comparison with the costs of equipping and operating a laboratory that uses the services. They said customer feedback has indicated that most customers (1) are willing to pay higher fees for new and improved services and (2) can adjust their budgets to the higher prices if they are aware of the price increases ahead of time. The NIST officials also observed that customers may be able to pass on price increases to their own customers or alternatively, depending on the degree of accuracy required, customers may reduce costs by using less expensive measurement services offered by private industry or increase the time between obtaining measurement services from NIST.

## Calibration Services

We found that the number of calibration tests performed increased in each year between fiscal years 1984 and 1988, even though the real average price per test also increased in each year except fiscal year 1984, indicating that changes in factors other than price also affected the demand for calibration services. For example, the largest price change, a 17-percent increase in fiscal year 1986, corresponded with a .2-percent increase in the number of tests performed. In fiscal year 1988, despite a real average price increase of 6 percent, the number of tests performed increased by 3 percent. (See app. I for a year-by-year analysis.)

[1] We analyzed NIST's average price for services in real dollars to account for inflation.

The Chief of NIST's Office of Physical Measurement Services said that the economic state of the defense and aerospace industries has been and is likely to continue to be the most important market force affecting the demand for calibration services. This is because defense procurement contracts that specify a high degree of measurement precision comprise a significant portion of the demand for calibration services.

## Standard Reference Materials

We found that price changes had some effect on the demand for standard reference materials between fiscal years 1979 and 1988. In particular, the largest price change, an increase of 23 percent in fiscal year 1983, corresponded with the largest change in demand, a decrease of 16 percent. However, factors other than price also affected the demand for standard reference materials. Both the real average price and the number of units sold increased in fiscal years 1985 and 1987, indicating that other factors overshadowed price changes. The magnitude of the fluctuations in demand in other years also reflected the effect of factors other than price. (See app. I for a year-by-year analysis.)

The Chief of the Office of Standard Reference Materials told us that several factors can affect the demand for particular standard reference materials. He said that it is not uncommon for NIST to be out of stock or have a backlog of orders for a given material. He cited, as an example, that the optical microscope linewidth-measurement standard has a waiting list of up to 2 years because (1) it is critical for producing integrated circuits, (2) NIST is the only producer of this material, and (3) NIST requires 2 weeks to produce each one. For the human serum standard reference material, although prices increased (28 percent in fiscal year 1987 and 9 percent in fiscal year 1988), sales increased even more (by 45 percent and 19 percent, respectively) because of increased quality consciousness in the clinical industry. Alternatively, he mentioned that sales of microscopy test charts dropped (from 2,335 units in fiscal year 1986 to 695 in fiscal year 1987) in large part because a major customer decided to produce its own.

## NIST's Analysis and Justification to the Committee for Fee Increases

In a letter dated September 19, 1988, the Director of NIST notified the Senate Committee on Commerce, Science and Transportation and the House Committee on Science, Space and Technology of NIST's intent to increase the development surcharge fees in fiscal year 1989. (See app. II.) The director concluded that the fiscal year 1988 development surcharge increases had "no deleterious impact" on measurement services income and that small business demand increased by 21 percent

for calibration services and declined by 1 percent for standard reference materials. Data were enclosed for both programs showing current and projected revenues from the proposed fee increases; the sales history for fiscal years 1978 through 1988, including the service levels, gross income, and average price per item; and a comparison of income collected in various categories of customers in fiscal years 1987 and 1988.

We believe NIST could have improved its analysis and presentation of information on the nature and possible impacts of the fee increases to assist the Committees in their deliberations by (1) clearly indicating that the development surcharges would be applied to only a portion of the total sales price, (2) analyzing annual changes in average prices and income using real dollars to account for inflation, (3) controlling for or explaining the likely effects of other factors on customer demand, and (4) more clearly showing the impact of price changes on customer demand. In addition, we noted that NIST could have improved its analysis of calibration services by comparing income with the number of calibrations, rather than the number of items calibrated, because NIST charges its customers on the basis of tests performed.

After we discussed our findings and observations with your office on January 30, 1989, you sent a letter to the acting Director of NIST on February 8, 1989, approving the proposed fiscal year 1989 fee increases but requesting that NIST meet with us to consider the results of our work and more clearly present data justifying any further increases. In a meeting with our staff on March 29, 1989, NIST officials agreed with our observations about how they could more clearly present information justifying future increases and added that our report would be helpful in preparing future justifications.

## Scope and Methodology

NIST officials provided us with information and statistics on the prices, service levels, and program income for calibration services and standard reference materials from fiscal years 1978 through 1988. We analyzed these data to determine the relationship between price changes and changes in service levels. To compare prices over time, we adjusted the average price for inflation by calculating a real average price by (1) adjusting yearly income to its 1982 equivalent by dividing it by the producer price index for intermediate materials, supplies, and components and (2) dividing the adjusted income by the number of calibration tests performed or units of standard reference materials sold, as appropriate. We also reviewed past, present, and planned pricing policies for these

services but did not survey NIST's customers to obtain their views on the impact of these pricing policies.

We conducted our review in January and February 1989. We discussed the report's contents with responsible agency officials and incorporated their views where appropriate. However, as requested by your office, we did not obtain formal agency comments on a draft of this report.

As agreed with your office, we are sending copies of this report to the Secretary of Commerce and other interested parties. Copies also will be made available to others upon request. Major contributors to this report are listed in appendix III.

John M. Ols, Jr.

John M. Ols, Jr.
Director, Housing and Community
Development Issues

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**Abbreviations**

| | |
|---|---|
| GAO | General Accounting Office |
| NIST | National Institute of Standards and Technology |

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# NIST Measurement Services: Service Levels and Income for Fiscal Years 1978-1988

**Table I.1: Service Levels and Income for Calibration Services**

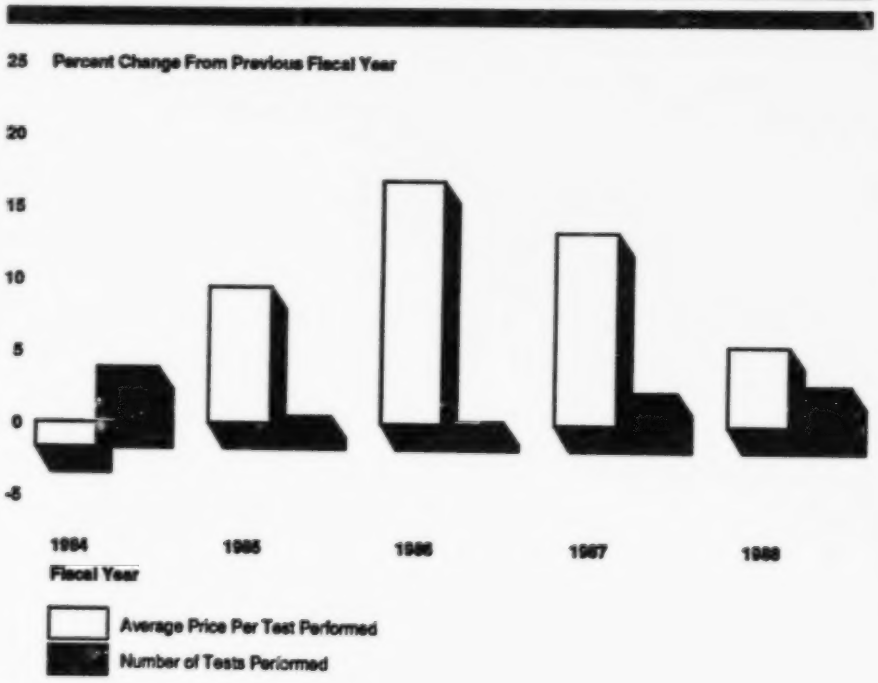
| Fiscal year | Tests performed[a] | Items calibrated | Total income (millions) |
|---|---|---|---|
| 1978 | N/A | 6,191 | $1.8 |
| 1979 | N/A | 6,924 | 2.1 |
| 1980 | N/A | 6,887 | 2.3 |
| 1981 | N/A | 7,506 | 2.5 |
| 1982 | N/A | 6,628 | 3.1 |
| 1983 | 12,209 | 8,087 | 3.6 |
| 1984 | 12,672 | 6,880 | 3.8 |
| 1985 | 12,737 | 5,779 | 4.1 |
| 1986 | 12,767 | 5,023 | 4.7 |
| 1987 | 13,059 | 5,611 | 5.5 |
| 1988 | 13,425 | 5,902 | 6.3 |

[a]NIST did not maintain records on the number of tests performed prior to fiscal year 1983.

**Table I.2: Service Levels and Income for Standard Reference Materials**

| Fiscal year | Units sold | Total income (millions) |
|---|---|---|
| 1978 | 37,387 | $2.5 |
| 1979 | 38,139 | 2.6 |
| 1980 | 40,847 | 3.0 |
| 1981 | 40,304 | 3.5 |
| 1982 | 39,523 | 3.8 |
| 1983 | 33,199 | 4.0 |
| 1984 | 36,674 | 4.4 |
| 1985 | 40,518 | 5.2 |
| 1986 | 40,149 | 5.2 |
| 1987 | 40,848 | 5.6 |
| 1988 | 44,484 | 6.4 |

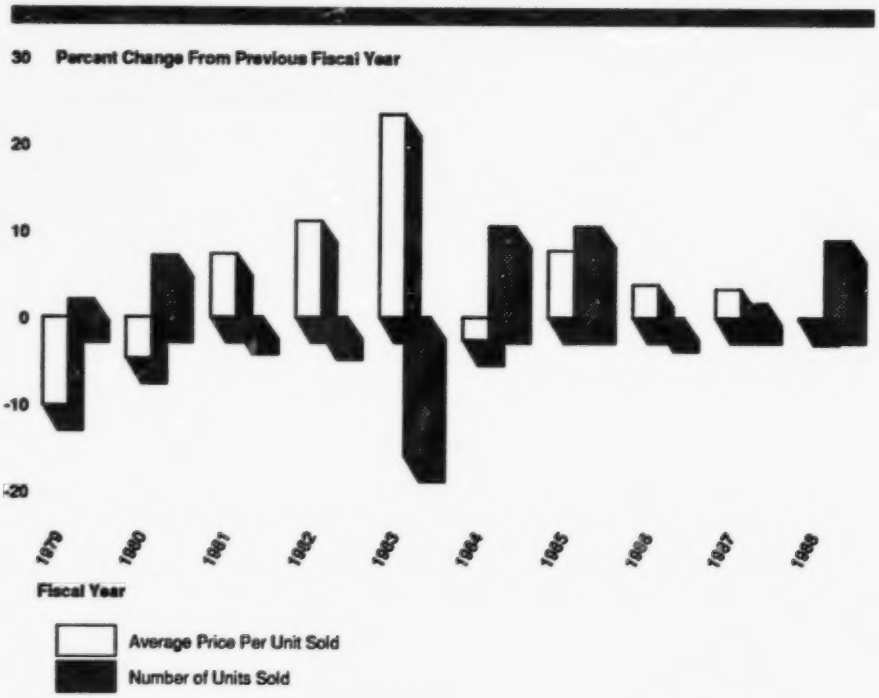
Figure I.1: Changes in Real Average Price Per Test and Number of Tests Performed for Calibration Services




Average price per unit was adjusted for inflation.

Source: Prepared by GAO from NIST data.

**Figure I.2: Changes in Real Average Price Per Unit and Number of Units Sold for Standard Reference Materials**




Average price per unit sold was adjusted for inflation.

Source: Prepared by GAO from NIST data.

# NIST's Justification for Its Fiscal Year 1989 Development Surcharge Fee Increases

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards

SEP 1 9 1988

Honorable Robert Roe
Chairman, Committee on Science,
Space and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

As I notified you last year, NIST increased its fees charged for standard reference materials and calibration services, effective December 6, 1987. This was part of our five-year plan to increase fees incrementally to a final surcharge level of approximately 40% for each service. The funds collected from the surcharges are used to offset costs associated with developing new and/or improved standard reference materials and calibrations needed by industry at large.

Improved measurement methods and standards are needed for measurement quality assurance in traditional science and technology areas, and at the same time, industry and the science communities need new measurement methods and standards for new emerging technologies. The increases for this past year have allowed NIST to further serve industry as a whole without adversely affecting individual customers, including small business. The next incremental increase in fees would allow NIST to further expand its efforts to improve its existing measurement services and develop new services.

In response to your Committee instructions dated November 17, 1987, NIST has monitored the effect of the 1988 fee increases on the demand for services and the impact on small business, non-profit organizations and other organizations with limited financial means. The data we have collected to date indicates no deleterious impact on income as a result of these fee increases and has resulted in a drop of only 1% in the income level from small business for reference materials and an increase of 21% in the level of calibration services provided to this same class of customers. I am enclosing several graphs displaying the sales history and income levels for both standard reference materials and calibrations.

Based on this review we intend to implement the second incremental increase to the fees at the beginning of fiscal year 1989. I am enclosing a chart showing current and projected revenues and surcharge rates from the increases.

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards

In accordance with Section 5114 of Public Law 100-418, the Omnibus Trade and Competitiveness Act of 1988, this letter is intended to notify you of our plans to implement this next incremental fee increase.

Sincerely,
Original Signed By
Ernest Ambler

Ernest Ambler
Director

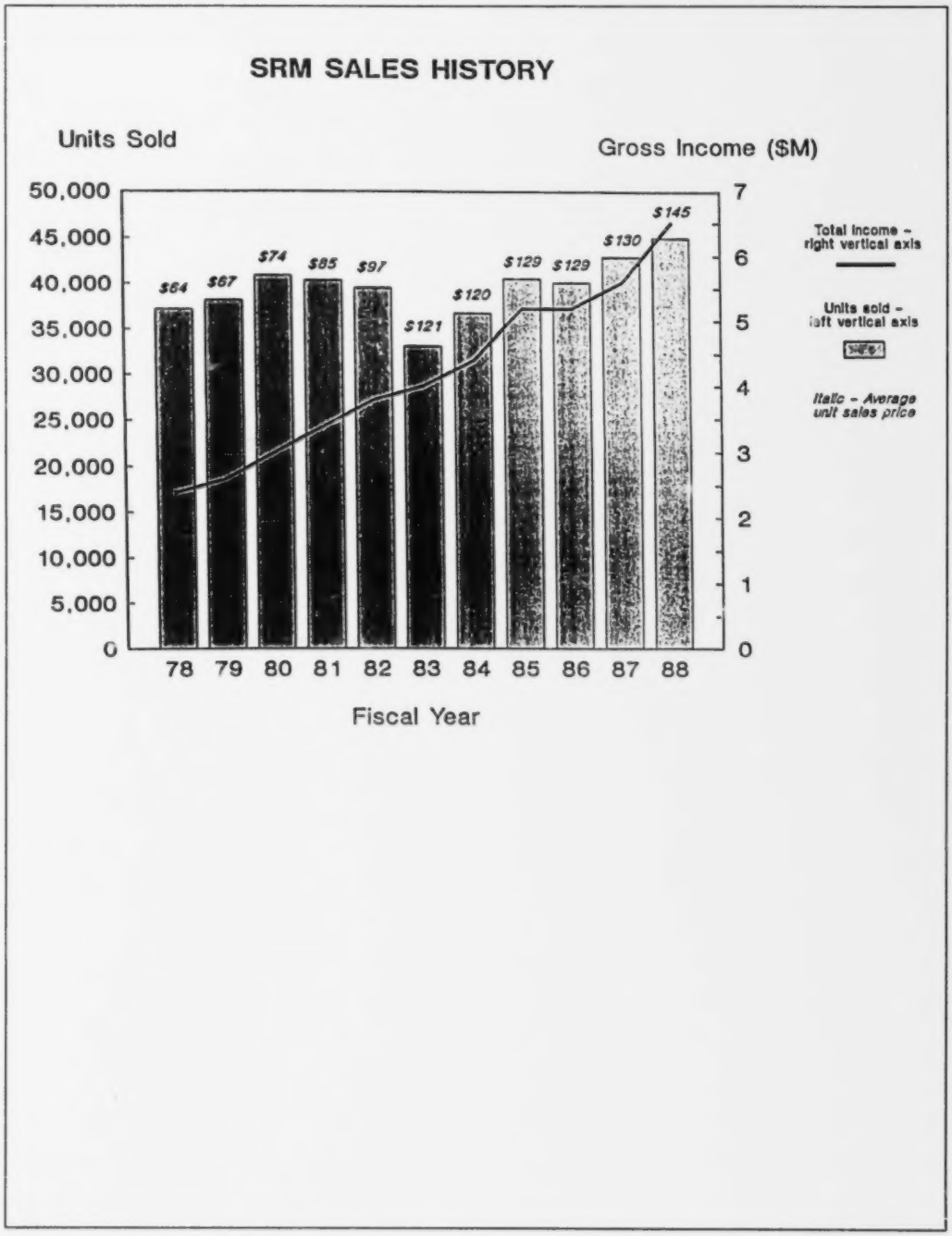
Enclosures

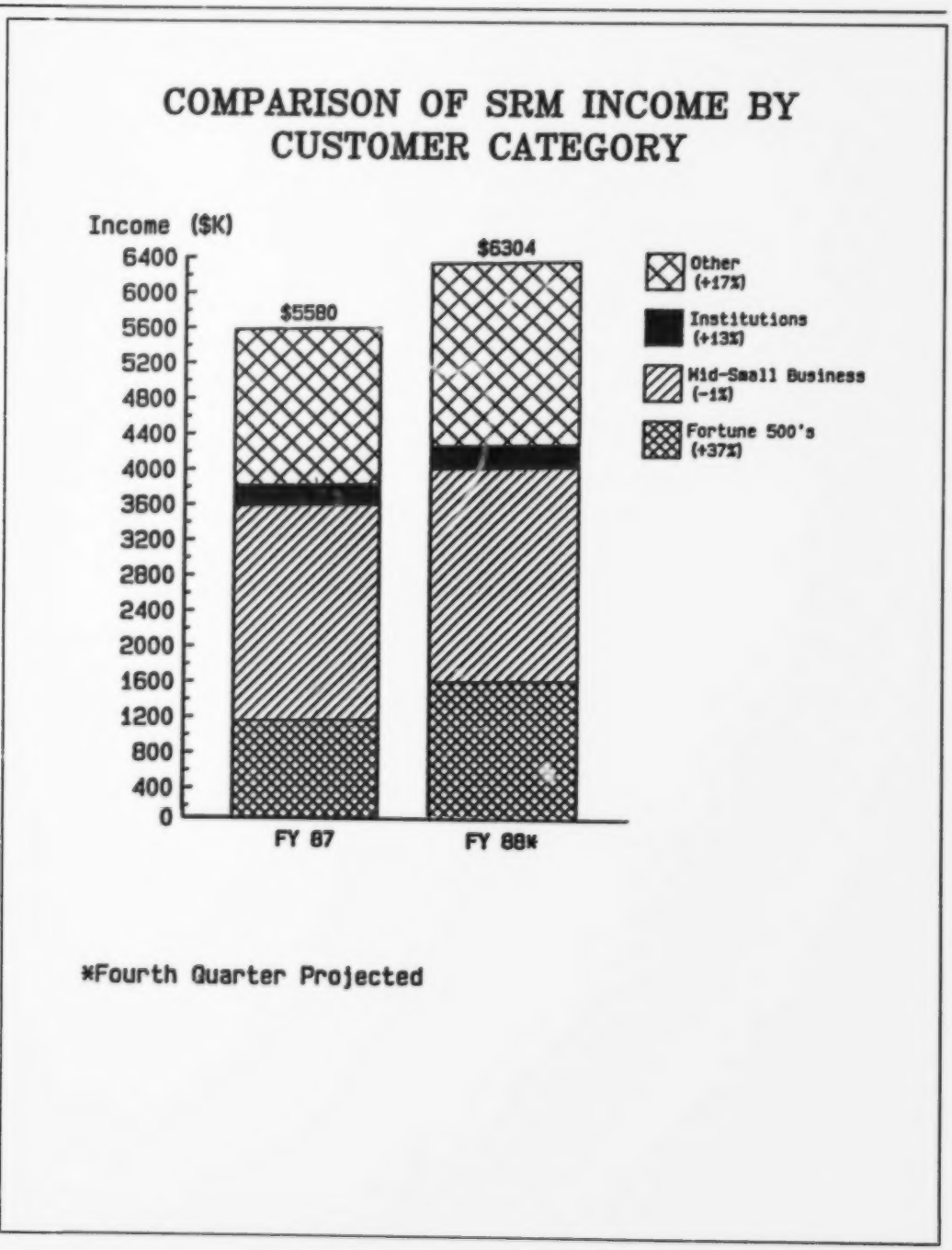
cc: Manuel Lujan, Jr.
Ranking Minority Member

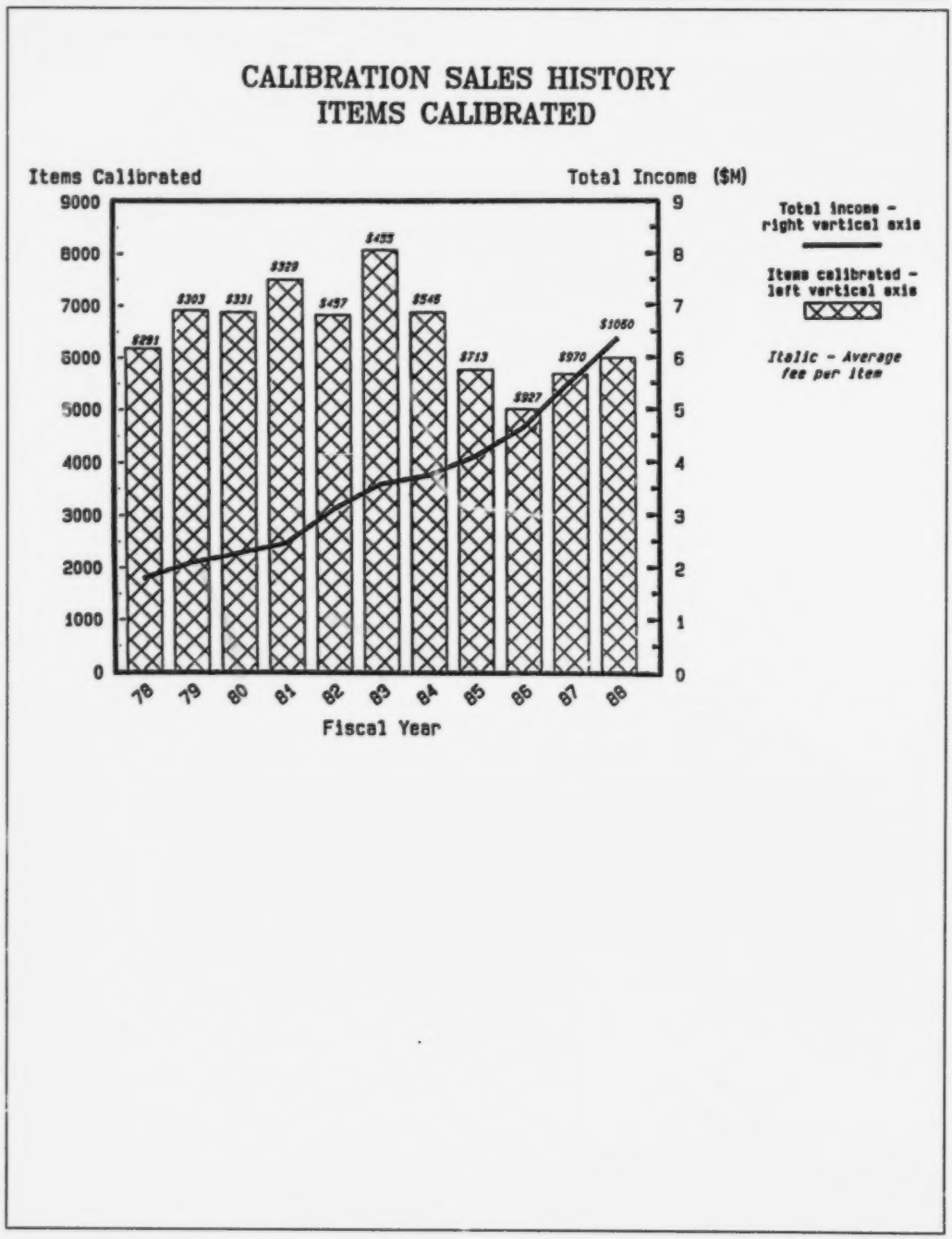
Current and Projected Revenues from Proposed Fee Increases

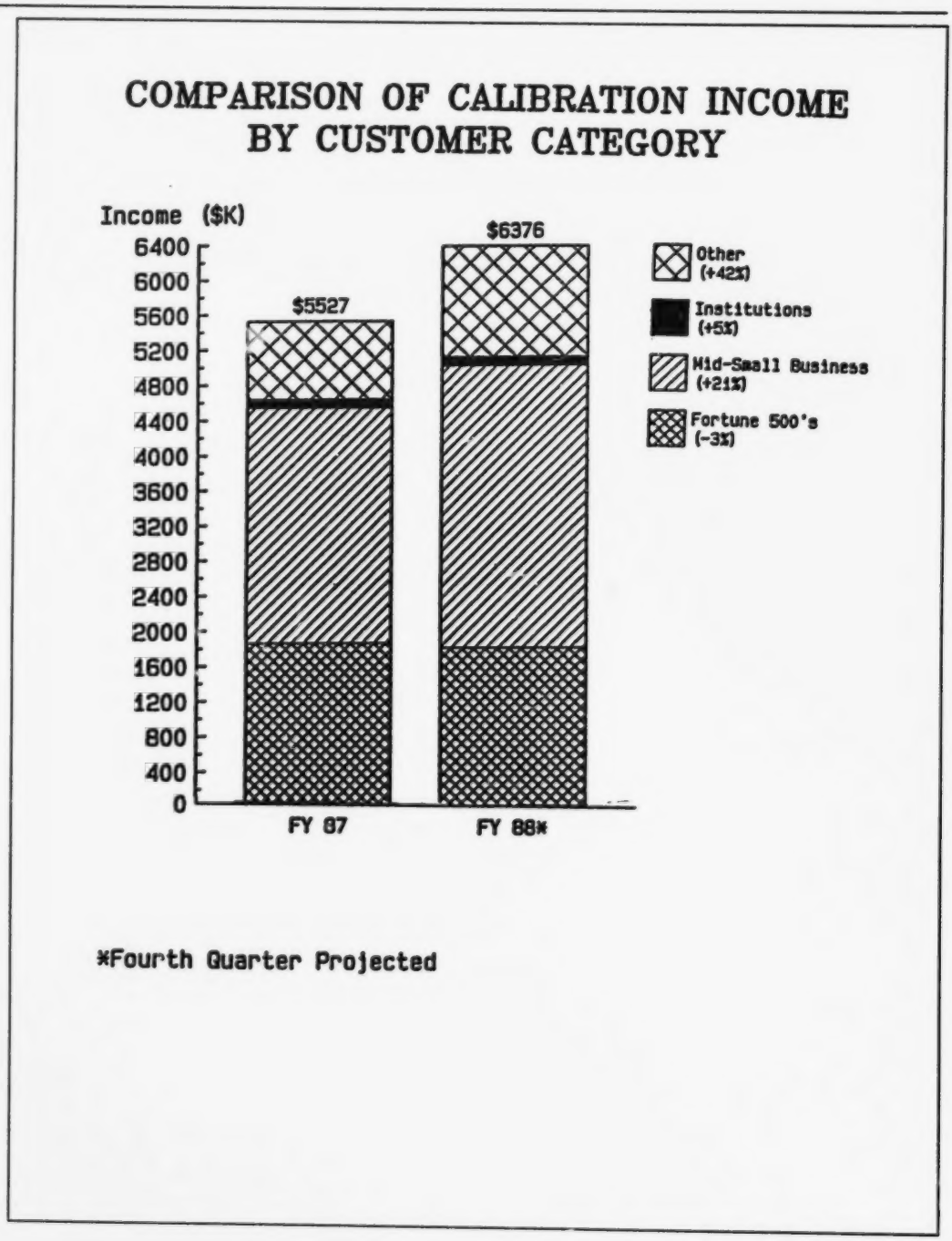
| | FY 87 | FY 88 | FY 89 | FY 90 | FY 91 | FY 92 |
|---|---|---|---|---|---|---|
| Calibrations | | | | | | |
| Technical service level: | ... | $5.5M | $6M | $6M | $6M | $6M |
| Development surcharge rate applied: | ... | 8% | 16% | 24% | 32% | 40% |
| Development funds from customer fees annually ($K): | ... | 250 a/ | 960 | 1,440 | 1,920 | 2,400 |
| Change margin: | ... | +250 | +710 | +480 | +480 | +480 |
| SRM | | | | | | |
| Production costs: | $2.3M | $2.3M | $2.4M | $2.4M | $2.4M | $2.4M |
| Development surcharge rate applied: | 15% | 20% | 25% | 30% | 35% | 40% |
| Development funds from customer fees annually ($K): | 348 | 463 | 600 | 720 | 840 | 960 |
| Change margin: | ... | +115 | +137 | +120 | +120 | +120 |
| Total combined cumulative | 348 | 713 | 1,560 | 2,160 | 2,760 | 3,360 |

a/ Lapsed resulting from delayed implementation for fiscal year 1988.


SRM SALES HISTORY
Units Sold
Gross Income ($M)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
7
6
5
4
3
2
1
0
$64
$67
$74
$85
$97
$121
$120
$129
$129
$130
$145
78 79 80 81 82 83 84 85 86 87 88
Fiscal Year
Total income - right vertical axis
Units sold - left vertical axis
Italic - Average unit sales price


COMPARISON OF SRM INCOME BY CUSTOMER CATEGORY
Income ($K)
6400
6000
5600
5200
4800
4400
4000
3600
3200
2800
2400
2000
1600
1200
800
400
0
$5580
$6304
FY 87
FY 88*
Other (+17%)
Institutions (+13%)
Mid-Small Business (-1%)
Fortune 500's (+37%)
*Fourth Quarter Projected


CALIBRATION SALES HISTORY
ITEMS CALIBRATED
Items Calibrated
Total Income ($M)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
9
8
7
6
5
4
3
2
1
0
$291
$303
$331
$329
$457
$455
$546
$713
$927
$970
$1050
78
79
80
81
82
83
84
85
86
87
88
Fiscal Year
Total income - right vertical axis
Items calibrated - left vertical axis
Italic - Average fee per item


COMPARISON OF CALIBRATION INCOME
BY CUSTOMER CATEGORY
Income ($K)
6400
6000
5600
5200
4800
4400
4000
3600
3200
2800
2400
2000
1600
1200
800
400
0
$5527
$6376
FY 87
FY 88*
Other (+42%)
Institutions (+5%)
Mid-Small Business (+21%)
Fortune 500's (-3%)
*Fourth Quarter Projected

Appendix III

# Major Contributors to This Report

## Resources, Community, and Economic Development Division Washington, D.C.

John M. Ols, Jr., Director, Housing and Community Development Issues, (202) 275-5525
Lowell Mininger, Assistant Director
Richard Cheston, Assignment Manager
Linda J. Weber, Evaluator-in-Charge
Mehrzad Nadji, Economist